Instruction Manual

REGULATED HIGH VOLTAGE SUPPLY

Model RE-1602/RE-1601

Ser. No. 376

NORTHEAST SCIENTIFIC CORPORATION
ACTON MASSACHUSETTS

Instruction Manual

REGULATED HIGH VOLTAGE SUPPLY

Model RE-1602/RE-1601

Ser. No. 376

Northeast Scientific Corporation

30 Wetherbee Street

Acton, Massachusetts

DANGER

WARNING

The output power and voltage level from this equipment can be high enough to kill or at least to cause serious injury. For this reason, the supply should always be operated completely enclosed, i.e., with the case on, and every care should be taken to avoid personal contact with the output leads or with the load being fed by the supply during the time that it is operating.

Although the equipment should be perfectly safe when the filaments only are energized (power switch in ST'D BY position), a good rule to follow is to turn it off completely when it is necessary to make adjustments that require personal contact with leads and components at a high potential with their surroundings.

REMEMBER

NO LIGHTS:	Completely off.
Amber or ONE LIGHT:	Stand-by position, filaments only applied.
Red and amber or TWO LIGHTS	HIGH VOLTAGE ON. BE CAREFUL.

MODEL RE-1602

SPECIFICATIONS

Output Voltage: 300 to 1600 volts DC, switch settings to plus or minus 2%, continuously variable in 100 and 10 volt steps with a 0 to 12 volt vernier.

Output Current: 0 to 10 milliamperes, full-load.

Polarity: Either side of the output may be grounded.

Ripple: Approximately 1 millivolt peak to peak maximum.

Regulation: .005% or better no-load to full-load at 1600 V DC output.

Internal Impedance: Approximately 1 ohm at DC, 0.15 ohm in series with approximately 35 microhenries to 1000 CPS, under 4 ohms to 1 Mc./Sec., measured at full-load at 1600 volts output. Impedance at DC is lower at lower output voltages.

Stability: .01% shift in output voltage at 1600 V for line voltage shift from 105 to 125 V AC.

Long-term Stability: .01% per hour, about 0.1% per day at a reasonably constant ambient temperature at 1600 V output, after warm-up.

Input: 105 to 125 V AC at a nominal input line frequency range of 50 to 500 CPS.

Terminals: Output: Insulated binding posts on front panel.

Input: Three wire grounding type AC chassis connector at the back with a detachable three wire power cord.

Tubes: 2 12AX7, 1 6FW5, 3 5651.

Dimensions: 6" wide by 9-7/8" high by 11-3/16" deep overall. Cabinet is 6" wide by 9" high by 10-5/16" deep.

Net Weight: 11-1/2 pounds.

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I

GENERAL DESCRIPTION

This is a compact and completely self-contained instrument that is portable and light in weight, suited for many of the high voltage problems encountered in the laboratory and test bench. These may range from photo-multipliers and small klystrons to component testing.

The instrument consists of a high voltage rectifier followed by a degenerative regulator arranged to supply a closely regulated DC high voltage to a load. Either side of the output may be grounded.

The power switch is arranged so that the filaments must be turned on first. After this, the high voltage can be turned on and off without having to wait for a warm-up period.

The supply is completely AC operated. It is compactly housed in a portable case for bench use. All operating controls and output terminals are mounted on the front panel. The power cord plugs into a connector at the back.

The high voltage rectifier is a full-wave voltage-doubler operating at line frequency. A minimum of filter is used in order to keep the energy storage as low as possible. This also helps to keep the size and weight of the supply down.

The regulator is of the degenerative series type. The control stage is operated as a tetrode, permitting large plate voltage excursions to be applied by the rectifier. A two-stage high-gain differential feedback amplifier compares part of the output with the reference and applies the amplified voltage difference to the control stage so that the output voltage is held within narrow limits, almost independent of input line voltage or output load current effects.

The output voltage is continuously variable over the entire range of 300 to 1600 volts DC and is varied by changing the feedback ratio in the regulator. This ratio is adjusted by switched resistors, which are deposited carbon types that will have good stability. The top control shifts the output in 100 V DC steps, the next control shifts the output in 10 V DC steps, and the bottom control (ΔV) is a vernier that will give an approximate 0 to 12 V DC variation. The output voltage is the sum of the dial readings.

The reference employed is three 5651 glow-discharge type reference tubes in series. These are located near the bottom of the cabinet so that their temperature environment is more even and the long-term performance of the supply is improved. This stability is determined mostly by these reference tubes and the deposited carbon resistors used in the sensitive parts of the regulator.

The tubes used are all popular types for which there should be no replacement problem in the event of their failure.

II

OPERATING INSTRUCTIONS

The supply may be operated in any normal location, if it is adequately protected from moisture and excessive dirt. If the instrument has been exposed to dampness, it should be opened and left in a warm dry place until it is thoroughly dry before being operated.

To prevent overheating, it is important that the perforated area of the case be uncovered so that there will be adequate ventilation. Otherwise the heat given off by the rectifier and regulator may raise the operating temperature too high.

Although the supply has been constructed with care and all components are well supported, excessive vibration and rough handling should be avoided.

Because of the everpresent danger, the supply should always be operated with the case on. The caution outlined at the beginning of this manual is repeated:

WARNING

The output power and voltage levels from this supply are high enough to kill, or at least to cause permanent or serious injury. For this reason, the supply should always be operated when completely enclosed, i.e., the case on, and every care should be taken to avoid personal contact with the output leads or the load being fed by the supply during the time that it is operating.

Although the supply is perfectly safe when the filaments only are energized, a good rule to follow is turn off completely the equipment when it is necessary to make adjustments that require in some way bodily contact with leads at high potential.

REMEMBER

NO LIGHTS: Completely off.

ONE LIGHT: Filaments only applied.

TWO LIGHTS: HIGH VOLTAGE ON. BE CAREFUL.

It is suggested that the supply be placed in operation in the following steps:

1. With the power cord out, check to see that the power switch is in the "OFF" position.

2. Connect the load to be fed to the output terminals. If one side of the output is to be grounded, connect a jumper between that output post and the bottom or ground post. This post is connected internally to the case and chassis.

3. The output voltage can now be set to the desired value, or to some arbitrary value that may be convenient initially. This setting is made by turning the voltage controls to the correct settings. For instance, if 1240 volts are needed, set the top control to 1.2 KV, the middle one to 40V, and the bottom vernier to 0. The calibration accuracy is 2% of the sum of the dial readings; hence, the bottom control may not enter significantly into the setting.

4. Insert the power cord into the back of the supply and plug it into some convenient power outlet. The supply will function over a line voltage input range of 105 to 125 V AC, at the nominal frequency range of 50 to 70 CPS. However, it should operate without difficulty at 400 CPS line frequency.

5. The supply is now ready to operate. Turn the power switch to the ST'D BY (stand-by) position. Filament power is now applied and the left or amber pilot should light to indicate this. Check this the first time the supply is operated after shipment by peering through the perforated portion of the case. The 12AX7's may be quite dim, since they are operated at low voltage, but this dimness does not indicate any abnormality. Allow about 1 minute for the cathodes to warm up completely.

6. After this warm-up period, the power switch can now be advanced to the ON position, to the extreme right. High voltage will now be on and the right-hand or red pilot light should indicate this condition. Power should now be flowing to the load. If no load current is being drawn, output voltage will be across the device to which it is connected.

7. If desired, the high voltage can be adjusted while the supply is operating by shifting the settings of the controls. The first switch at the top will switch the output in 0.1 KV or 100 V steps, the second or middle switch will shift the output in 10 V steps, and the bottom vernier will give an approximate 0 to 12 V variation to fill in the voltages between these steps.

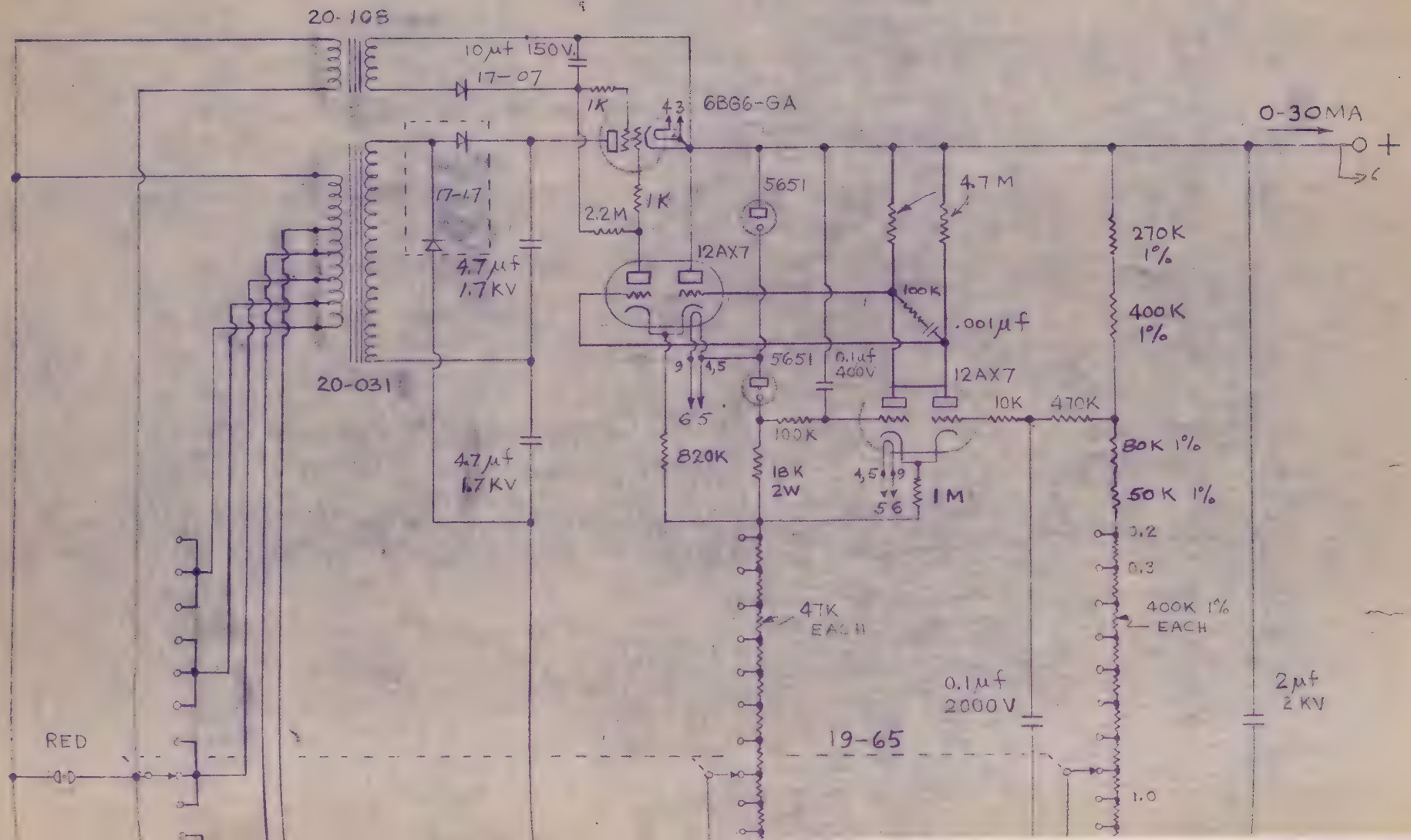
8. The load can be varied as desired and the supply will continue to regulate properly so long as the rated load current (10 Ma.) is not exceeded and the applied line voltage does not fall below 105 V AC. At less than full-load, the regulator will continue to function at even lower line voltages, even though the regulator action may be somewhat degraded. The lowest line voltage that can be allowed depends upon the output voltage and current being drawn. Generally, the less the current, the lower the line voltage can be before regulation fails.

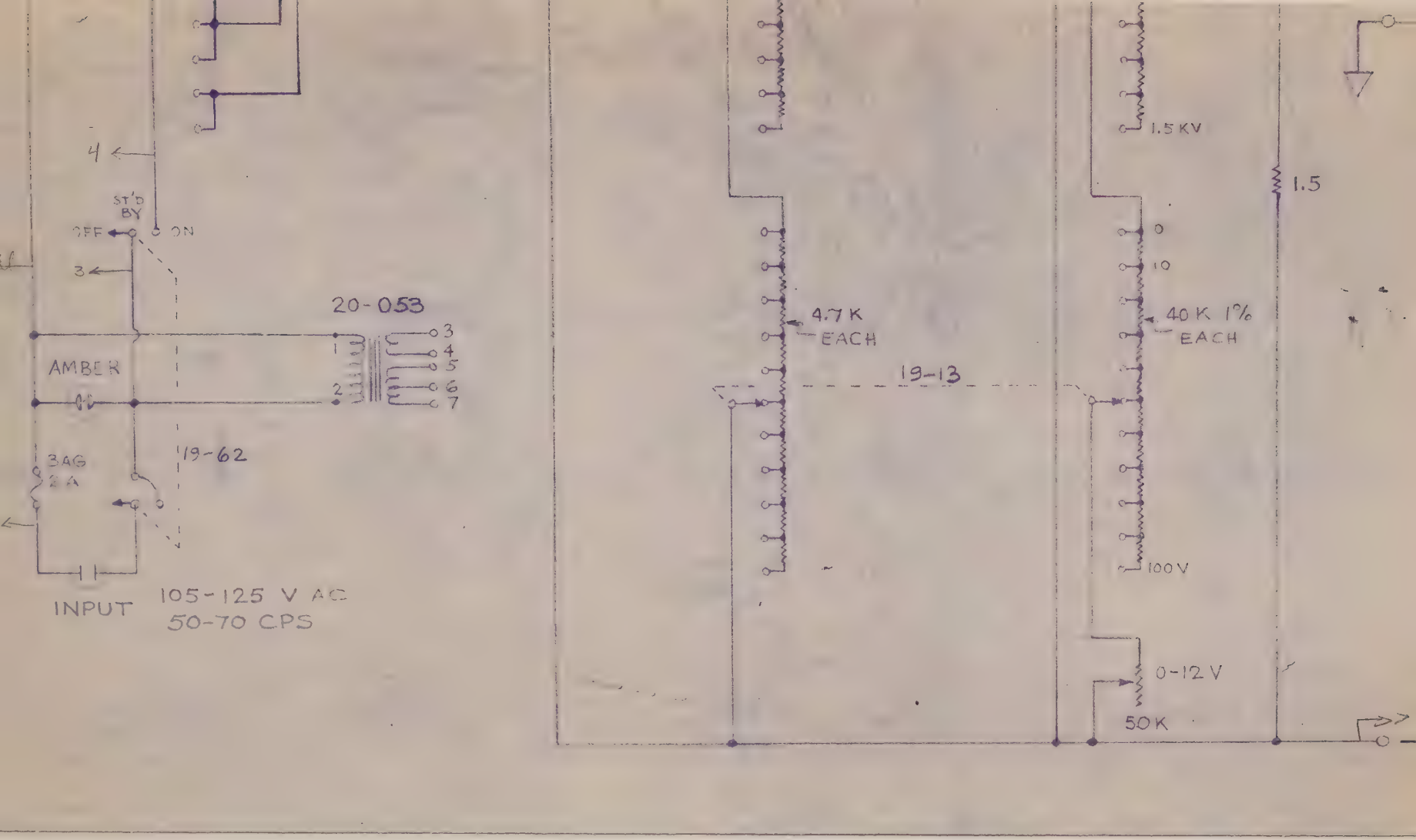
This supply is designed for portable use. It may be used for application in any position that may be convenient. It should be remembered, however, that it is necessary to leave the perforated area of the cover open so that there will be sufficient ventilation.

The case can be removed from the unit very easily by taking out the three binding head screws at the back of the cabinet after which the case can be slipped off the chassis. Of course, the power cord should be removed first.

All tubes will be easily accesible with the case off. There should not be anything too critical about their characteristics, and direct substitution for a type should obtain satisfactory operation, assuming that the tube is in good condition. In the case of the two twin-triodes in the amplifier, they are operated so conservatively that generally they give adequate performance in the regulator, even though they may not operate satisfactorily under normal conditions.

The reference tubes are mounted on the side wall of the chassis in a spot that should remain reasonably cool and still allow them to be accessible. Before the case is put back on the unit, it may be wise to check to see that they are well seated in their sockets.


20-108
10μf 150V.
17-07
1K
43
6BG6-GA
0-30MA
+
-
17-17
2.2M
1K
5651
4.7M
12AX7
270K
1%
4.7μf
1.7KV
100K
.001μf
400K
1%
20-031
9
4,5
5651
0.1μf
400V
12AX7
65
10K
470K
820K
100K
18K
2W
4,5,9
56
1M
80K 1%
50K 1%
0.2
0.3
47K
EACH
400K 1%
EACH
0.1μf
2000V
2μf
2 KV
RED
19-65
1.0


4
ST'D BY
OFF
ON
3
20-053
AMBER
1
2
3
4
5
6
7
3AG
2 A
19-62
INPUT
105-125 V AC
50-70 CPS
4.7 K
EACH
19-13
1.5 KV
1.5
0
10
40 K 1%
EACH
100 V
0-12 V
50 K

WARRANTY

This instrument is guaranteed to the original purchaser to be free of defects in material and workmanship for a period of six (6) months from the date of shipment. Our responsibility under this warranty is limited to the repair or replacement of the instrument or any defective part thereof.

Our responsibility will cease and the conditions of this warranty will be considered to have been voided if any electrical connection or wiring has been disconnected, even though reconnected, or any electrical or physical modifications made, these actions having been taken by or for any person other than our authorized representatives and without our express authorization, or if the instrument has been subjected to abuse or to conditions other than those of ordinary wear and usage, or operated in any manner other than according to the operating instructions in the instruction manual.

For service under this warranty, please advise us promptly of the details pertinent to the failure.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THOSE SET FORTH HEREIN AND THE DESCRIPTION OF THE INSTRUMENT.

IMPORTANT

When notifying us regarding any Northeast Scientific instrument, please give us the serial and model number.

ADDITIONAL INFORMATION

In addition to the supplies and equipment listed in the Catalog, we also can supply the following new ones which are not described:

Model	Voltage Range	Output Current	Prototype	Price
ZRE-1101	0-1.1KV DC	0-15 Ma. DC	RE-1603	$425.00
ZRE-1603	0-1.6 KV DC	0-10 Ma. DC	RE-1603	$425.00

We can supply most of the units in the catalog with their voltage range starting from zero, if it should be desirable to the user. There is an extra charge of $202.00 in addition to the prototype price, except for the two shown above. "Zero" supplies are designated by adding "Z" before the model number as shown above.

All supplies in the catalog are designed to be operable floating at 8 KV DC to ground (chassis).

The only exceptions are the supplies built in the Portable pattern. They can be floated only to about one-half their output voltage and cannot be obtained with "zero" ranges.

We are also in a position to make modifications to these units as may be desirable or convenient for the user, i.e., polarity switches on the front panel (or elsewhere), coaxial or other choices of output terminations, wire-wound precision resistors in the comparison string in the feedback circuits, metering, Mil tubes (where possible), special painting, etc.

We are also in a position to make "high voltage" constant-current supplies. The catalog does not go into this. We are trying to get out a line of catalog units, but until they are ready, please let us know your requirements.

Model ZRE-0503

TENTATIVE SPECIFICATIONS

Output Voltage: 0 to 550 V DC, continuously adjustable in steps of 50 volts in conjunction with a 0 to 60 volt vernier. The output voltage is within 2% of the sum of the dial readings.

Output Current: 0 to 30 milliamperes, full-load.

Polarity: Either side of the output may be grounded.

Ripple: About 1 MV peak to peak.

Regulation: .005% or better no-load to full-load at 550 V output.

Stability: .01% shift in output voltage for an input line voltage change from 105 to 125 V, at 550 V output.

Long-term Stability: .01% per hour, 0.1% per day in a normal ambient temperature after warm-up, the ambient temperature being free of wide and/or sudden changes.

Input: 105 to 125 volts AC, at a nominal line frequency range of 50 to 500 CPS, 0.55 amps. max., 55 watts max.

Terminals: Insulated binding posts at the rear of the cabinet. Input connection is by means of a standard male AC chassis connector and an all rubber molded power cord.

Tubes: 5 12AX7, 1 6DJ8, 1 6FW5, 3 5651.

Dimensions: 5-1/4" high by 19" wide by 10" deep overall. Cabinet alone is 8-1/2" deep.

Net Weight: 16 pounds.

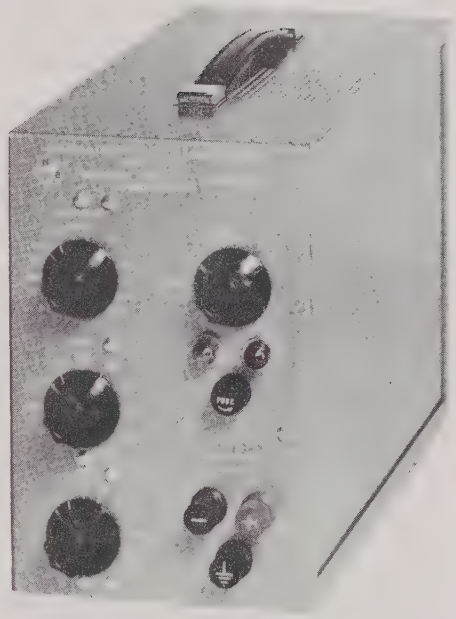
REGULATED HIGH VOLTAGE SUPPLY

200 to 1600 Volts

30 MA MODEL RE-1601

Uses: This supply provides a regulated output voltage over a wide range. The output voltage is stable and contains very low ripple. Either side of the output may be grounded and as much as 30 Ma. full-load current is available. The unit is small and light for easy portability so that it is very useful as a utility instrument about the laboratory or plant.

Typical uses include those in circuit development and operation with klystrons, photomultipliers, traveling wave tubes and backward wave oscillators, set ups for the determination of the characteristics of condensers, resistors, and other components, and many other problems in the laboratory and at the test position.



FEATURES

- Very wide voltage range, 200 to 1600 volts.
- Either positive or negative may be grounded.
- 30 Ma. full-load current.
- Low internal impedance, 1.5 ohms at full-load at 1600 V.
- Excellent regulation: better than .005% no-load to full-load.
- High stability: better than .01% for 20% line voltage shift.
- Good long-term stability.
- Standard tubes: no replacement problem.
- Portable, compact, light weight.

MODEL RE-1601

Description: These instruments consist of a rectifier followed by an electronic regulator. *Either side of the output may be grounded.*

The rectifier is a voltage doubler operating at the input line frequency and using silicon cells for simplicity and dependable performance.

The regulator is of the degenerative series type. A tetrode control stage used in conjunction with a two-stage balanced differential feedback amplifier closely regulates the output voltage so that it is practically independent of input line voltage variations or output load effects. Residual line frequency ripple is very low. Internal impedance is of the order of ohms.

Long-term stability in such regulators is determined primarily by the comparison resistors in the sensitive parts of the regulator and the reference employed. Generally, deposited carbon resistors are used but wire-wound precision types can be included on special order when it is required. Type 5651 glow tubes are used for reference.

The output voltage is continuously variable over the entire range of 200 to 1600 volts. It is set by three front panel controls, the first a switch covering 200 to 1500 volts in 100 volt steps, a second covering 0 to 100 volts in 10 volt steps, and the third control a calibrated vernier with a continuous 0 to 12 volt range. The resulting output voltage is good to 2% of the sum of the dial readings.

This supply is completely AC operated and self-contained. The portable housing is ventilated and has a narrow front dimension in order to save bench space. The cover can be slipped off the unit by removing three screws. All operating controls are mounted on the front panel. The output terminals are three insulated binding posts on the front panel. The input line connection is made at the back with a detachable molded power cord. All the tubes used are popular types for which there will be no procurement problem.

SPECIFICATIONS

Output Voltage — 200 to 1600 volts DC, ±2%, continuously variable.

Output Current — 0 to 30 Ma. full-load.

Polarity — Either side of the output may be grounded.

Ripple — 2 Mv. peak to peak maximum at line frequency.

Regulation — Better than .005% no-load to full-load at 1600 V output.

Internal Impedance — 1.5 ohms at DC, 0.15 ohms in series with approximately 40 microhenries to 1000 CPS, under 2 ohms to 1 Mc./Sec., measured at 1600 V output with 30 Ma. load.

Stability — .01% for input line voltage shift from 105 to 125 V AC at 1600 V output.

Long-term Stability — .02% per hour, 0.1% per day after warm-up at 1600 V output in a normal ambient temperature without sudden and wide temperature changes.

Input — 105 to 125 volts AC, 50 to 500 CPS, 0.6 Amps. max., 65 watts max.

Terminals — Output: Insulated binding posts on the front panel.

Input: Standard male AC chassis connector at back. A detachable all rubber molded power cord supplied with the unit.

Tubes — 2 12AX7, 2 5651, 1 6BG6-GA.

Construction — Ventilated cabinet mounted on rack panel suitable for rack mounting or bench use. Gray hammertone finish with white marking. All operating controls mounted on the front panel away from output connections at back.

Dimensions — Cabinet is 6" wide by 9" high by 13¾" deep. Handle extends ⅝" above top, feet ⅜" below bottom, knobs and binding posts ⅞" beyond front panel.

Net Weight — 17 pounds.

NORTHEAST SCIENTIFIC CORPORATION
30 WETHERBEE ST. ACTON, MASS.

REGULATED HIGH VOLTAGE SUPPLY

200 to 1600 Volts

30 MA MODEL RE-1601

Uses: This supply provides a regulated output voltage over a wide range. The output voltage is stable and contains very low ripple. Either side of the output may be grounded and as much as 30 Ma. full-load current is available. The unit is small and light for easy portability so that it is very useful as a utility instrument about the laboratory or plant.

Typical uses include those in circuit development and operation with klystrons, photomultipliers, traveling wave tubes and backward wave oscillators, set ups for the determination of the characteristics of condensers, resistors, and other components, and many other problems in the laboratory and at the test position.

FEATURES

- Very wide voltage range, 200 to 1600 volts.
- Either positive or negative may be grounded.
- 30 Ma. full-load current.
- Low internal impedance, 1.5 ohms at full-load at 1600 V.
- Excellent regulation: better than .005% no-load to full-load.
- High stability: better than .01% for 20% line voltage shift.
- Good long-term stability.
- Standard tubes: no replacement problem.
- Portable, compact, light weight.

MODEL RE-1601

Description: These instruments consist of a rectifier followed by an electronic regulator. *Either side of the output may be grounded.*

The rectifier is a voltage doubler operating at the input line frequency and using silicon cells for simplicity and dependable performance.

The regulator is of the degenerative series type. A tetrode control stage used in conjunction with a two-stage balanced differential feedback amplifier closely regulates the output voltage so that it is practically independent of input line voltage variations or output load effects. Residual line frequency ripple is very low. Internal impedance is of the order of ohms.

Long-term stability in such regulators is determined primarily by the comparison resistors in the sensitive parts of the regulator and the reference employed. Generally, deposited carbon resistors are used but wire-wound precision types can be included on special order when it is required. Type 5651 glow tubes are used for reference.

The output voltage is continuously variable over the entire range of 200 to 1600 volts. It is set by three front panel controls, the first a switch covering 200 to 1500 volts in 100 volt steps, a second covering 0 to 100 volts in 10 volt steps, and the third control a calibrated vernier with a continuous 0 to 12 volt range. The resulting output voltage is good to 2% of the sum of the dial readings.

This supply is completely AC operated and self-contained. The portable housing is ventilated and has a narrow front dimension in order to save bench space. The cover can be slipped off the unit by removing three screws. All operating controls are mounted on the front panel. The output terminals are three insulated binding posts on the front panel. The input line connection is made at the back with a detachable molded power cord. All the tubes used are popular types for which there will be no procurement problem.

SPECIFICATIONS

Output Voltage — 200 to 1600 volts DC, ±2%, continuously variable.

Output Current — 0 to 30 Ma. full-load.

Polarity — Either side of the output may be grounded.

Ripple — 2 Mv. peak to peak maximum at line frequency.

Regulation — Better than .005% no-load to full-load at 1600 V output.

Internal Impedance — 1.5 ohms at DC, 0.15 ohms in series with approximately 40 microhenries to 1000 CPS, under 2 ohms to 1 Mc./Sec., measured at 1600 V output with 30 Ma. load.

Stability — .01% for input line voltage shift from 105 to 125 V AC at 1600 V output.

Long-term Stability — .02% per hour, 0.1% per day after warm-up at 1600 V output in a normal ambient temperature without sudden and wide temperature changes.

Input — 105 to 125 volts AC, 50 to 500 CPS, 0.6 Amps. max., 65 watts max.

Terminals — Output: Insulated binding posts on the front panel.

Input: Standard male AC chassis connector at back. A detachable all rubber molded power cord supplied with the unit.

Tubes — 2 12AX7, 2 5651, 1 6BG6-GA.

Construction — Ventilated cabinet mounted on rack panel suitable for rack mounting or bench use. Gray hammertone finish with white marking. All operating controls mounted on the front panel away from output connections at back.

Dimensions — Cabinet is 6" wide by 9" high by 13¾" deep. Handle extends ⅝" above top, feet ⅜" below bottom, knobs and binding posts ⅞" beyond front panel.

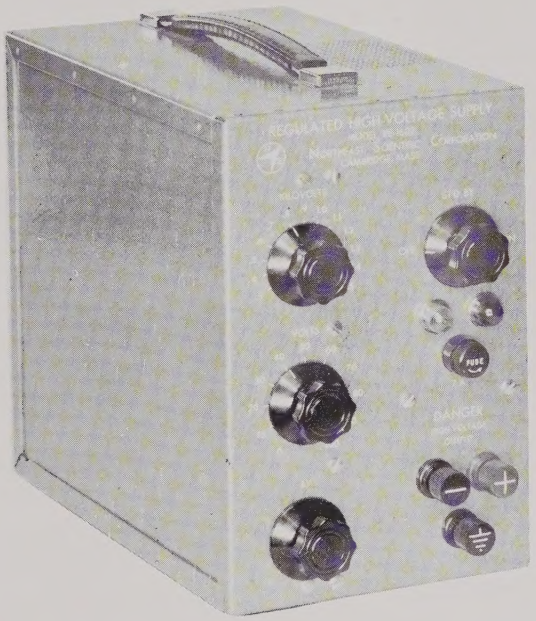
Net Weight — 17 pounds.

NORTHEAST SCIENTIFIC CORPORATION
30 WETHERBEE ST. ACTON, MASS.

REGULATED HIGH VOLTAGE SUPPLY

300 - 1600 Volts

10 MA **MODEL RE-1602**



Uses: A very compact and light weight supply intended for general use about the laboratory, in the field, and at the test bench.

This supply has been designed to be as small and compact as possible consistent with a wide output voltage range, good performance, and useful current output capacity.

Typical uses include those in research work and circuit development with photomultipliers, klystrons, electron accelerators, component testing and evaluation, and many other applications where a stable and/or wide range DC voltage having optional polarity is needed.

FEATURES

- Very wide voltage range: 300 to 1600 volts.
- Either positive or negative may be grounded.
- 10 Ma. full-load current.
- Low internal impedance: about 1 ohm.
- Excellent regulation: better than .005% no-load to full-load.
- High stability: better than .01% for 20% line voltage shift.
- Good long-term stability.
- Standard tubes: no replacement problem.
- Portable: very compact and light weight.

MODEL RE-1602

Description: These instruments consist of a rectifier followed by an electronic regulator. *Either side of the output may be grounded.*

The rectifier is a voltage doubler operating at the input line frequency and using silicon cells for simplicity and dependable performance.

The regulator is of the degenerative series type. A tetrode control stage used in conjunction with a two-stage balanced differential feedback amplifier closely regulates the output voltage so that it is practically independent of input line voltage variations or output load effects. Residual line frequency ripple is very low. Internal impedance is of the order of ohms.

Long-term stability in such regulators is determined primarily by the comparison resistors in the sensitive parts of the regulator and the reference employed. Generally, deposited carbon resistors are used but wire-wound precision types can be included on special order when it is required. Type 5651 glow tubes are used for reference.

The output voltage is continuously variable over the entire range of 300 to 1600 volts. It is set by the three front panel controls, the first switch covering 300 to 1500 volts in 100 volt steps, the second from 0 to 100 volts in 10 volt steps, and the third control is a vernier giving an approximate 0 to 12 volt variation to fill in these steps. The resulting output voltage is the sum of the dial readings to an accuracy of 2%.

These light weight supplies are very compactly housed in a portable case so that they are easily carried to the spot at which they are to be used. The cabinet is ventilated and under normal operating circumstances the temperature rise of the unit is low. The supplies are completely AC operated and self contained. All tubes are popular types for which there should be no replacement problem.

All operating controls are mounted on the front panel along with the output terminals. The input connections are made through a detachable molded power cord fitting a standard AC connector at the back.

SPECIFICATIONS

Output Voltage — 300 to 1600 volts, ±2%, continuously variable.

Output Current — 0 to 10 Ma., full-load.

Polarity — Either side of the output may be grounded.

Ripple — Approximately 1 Mv. peak to peak.

Regulation — .005% no-load to full-load at 1600 volt output.

Internal Impedance — Approximately 1 ohm at DC, 0.15 ohm in series with approximately 35 michrohenries at 1000 CPS, under 4 ohms to 1 Mc/Sec., measured at full-load at 1600 volts output. At DC the impedance will decrease at lower output voltages.

Stability — .01% shift in output voltage at 1600 V for a line voltage shift from 105 to 125 V AC.

Long-term Stability — About .01% to .02% per hour, 0.1% to 0.2% per day after warm-up in a normal ambient temperature without wide and sudden temperature fluctuations.

Input — 105 to 125 V AC at a nominal 50 to 500 CPS 0.5 Amp. max., 50 watts max.

Terminals — Output: Insulated binding posts on the front panel.

Input: Detachable all rubber molded power cord fitting a standard male AC chassis connector at the back.

Tubes — 2 12AX7, 3 5651, 1 6FW5

Construction — Light compact portable construction with leather carrying handle. Ventilated cover slips off the unit after removing three screws at the back. Gray hammertone finish with white marking. All controls and output connectors on the front panel.

Dimensions — Cabinet is 6" wide by 9" high by 10 5/8" deep. Handle extends 5/8" above top, feet 3/8" below bottom, knobs and binding posts 7/8" beyond front panel.

Net Weight — 12 pounds.

NORTHEAST SCIENTIFIC CORPORATION
30 WETHERBEE ST. ACTON, MASS.

MP MASTER
MA29365